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PROJECT SPECIFICATION CONSULTATION REPORT - Development of the Queensland – New South Wales Interconnector

Origin Energy Ltd (Origin) welcomes the opportunity to comment on the Project Specification Consultation Report in relation to the development of the Queensland – New South Wales Interconnector (QNI).

Origin is a major Australasian integrated energy company focused on gas exploration, production and export, power generation and energy retailing. Listed in the top 20 on the S&P Australian Stock Exchange (ASX), Origin retails energy to 4.4 million electricity, natural gas and LPG customer accounts and has one of the Australia's most flexible generation portfolios with over 5,300 MW of capacity, through either owned or contracted generation.

Through Australia Pacific LNG, our incorporated joint venture with ConocoPhillips and Sinopec, Origin is developing one of Australia's largest Coal Seam Gas (CSG) to LNG projects. The process includes taking coal seam methane gas from Queensland's Surat Basin and processing it into liquefied natural gas on Curtis Island near Gladstone. The peak demand of this project will exceed 450 MW.

We are also a significant investor in low emissions and renewable energy technologies, including gas, geothermal, wind, hydro and solar and are the largest retailer of green energy products in Australia. Origin is currently investigating the feasibility of connecting a very large scale (in excess of 2000 MW) hydropower project in Papua New Guinea into the Queensland region of the Australian NEM.

Origin has a significant interest in the efficient operation of the NEM in both the short and longer term, with a particular interest in the role that QNI plays in the market.

In that context, we are cognisant of a number of changing factors impacting the economics and consequent transmission planning in the NEM, including:

- Government policy in respect of renewable energy targets;
- the recent decline in forecast demand by AEMO due to economic conditions, as well as the widespread take-up of PV solar in the NEM;
- the current Transmission Frameworks Review being conducted by the AEMC; and
- future new LNG and mining loads in Queensland.

Origin supports transmission projects that promote efficient outcomes from a whole-of-NEM perspective and considers timely interconnector upgrades play an important role in that. In particular, Origin believes a QNI upgrade will:

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1. Deliver least overall cost energy to the NEM;
2. Improve Economic Investment in the NEM;
3. Unlock additional competition benefits; and
4. Potentially, increase reliability of supply in the NEM.

These benefits will lead to a more efficient electricity system for end-use customers.

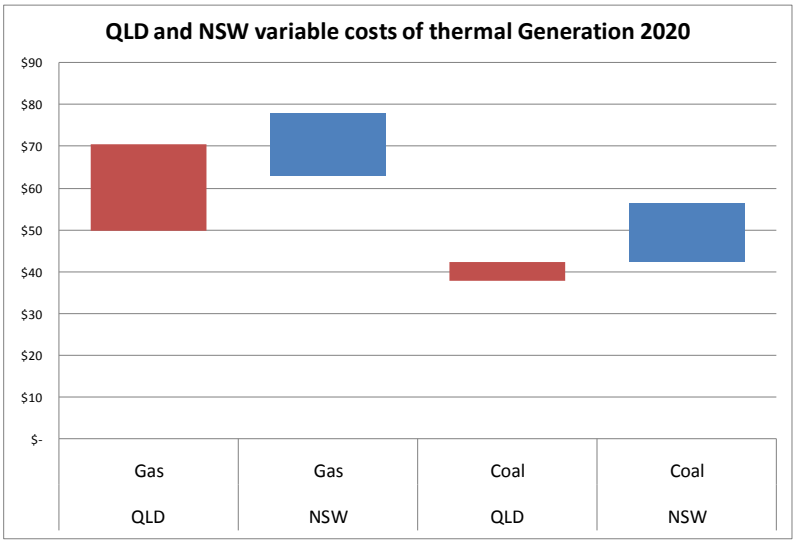
1. Least cost energy delivered to the NEM

Fuel costs

Regional gas and coal fuel costs vary across the NEM. Upgrading transmission capacity between Queensland and New South Wales can help facilitate dispatch of the most efficient mix of generation plant from across the NEM.

Figure 1 below charts the forecast range of different fuel costs for generating plant in Queensland and New South Wales in 2020. These costs take into consideration a range of gas and coal prices in Queensland and New South Wales and carbon across the NEM.

Figure 1. QLD and NSW variable costs of thermal generation in 2020

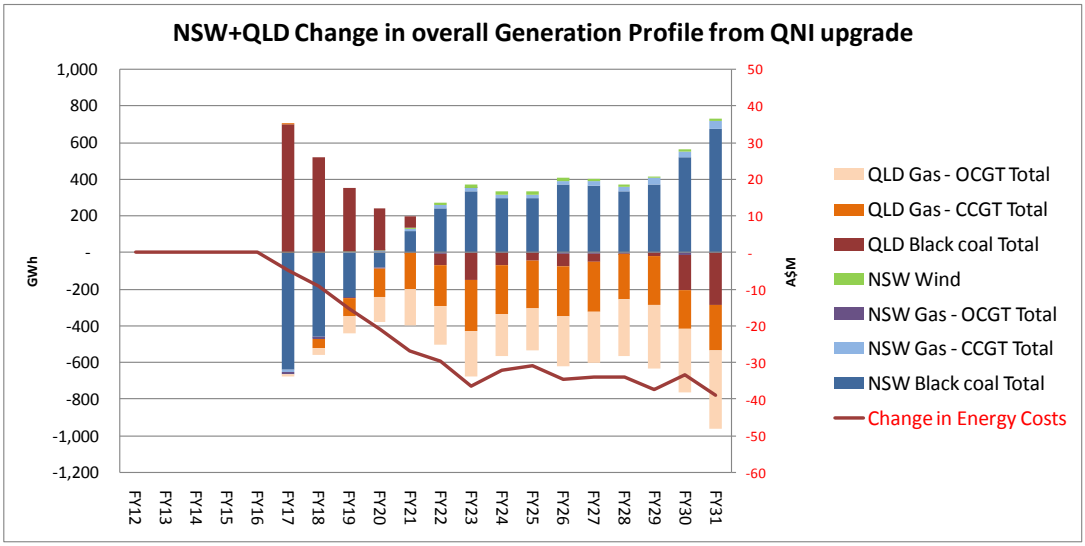


The chart indicates that coal fired plant in New South Wales and Queensland is often cheaper than combined cycle gas turbine (CCGT) plant and that Queensland coal fired plant tends to be cheaper than New South Wales coal plant, largely due to lower Queensland coal costs.

A number of Queensland coal generators receive their coal from captive mines. New South Wales coal mines, however, are less captive to generators in that region and have other customer/export options available. This leads to higher fuel prices and generation costs overall in New South Wales.

Origin has also undertaken analysis on the likely change to the News South Wales and Queensland generation profile, assuming a 600 MW upgrade (both directions) to the QNI occurs just prior to the 2017 financial year. Figure 2 below illustrates this change.

Figure 2. NSW and QLD Gas and Coal Fired Generation – with QNI upgrade



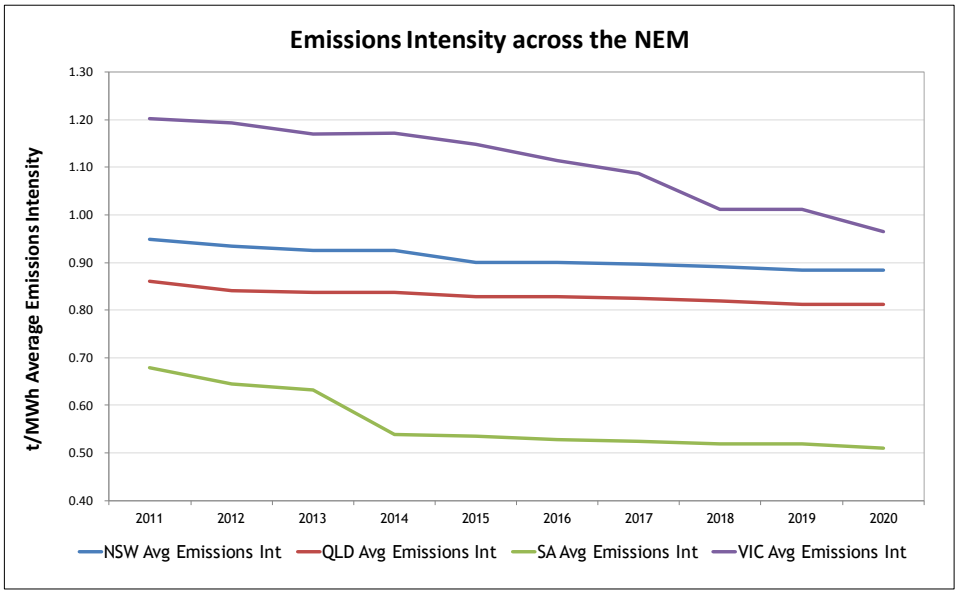
The graph shows that, with a 600MW upgrade on the interconnector, Queensland coal-fired plant displaces New South Wales coal-fired plant. This occurs initially at off-peak times and then gradually extends in the peak periods also. The key switch occurs in the 2021 financial year, when New South Wales coal-fired plant displaces the more expensive Queensland CCGT and OCGT capacity.

The total impact across the peak and off-peak is to lower fuel costs by some $30-$40 million per annum, which has an overall net present value (NPV) of approximately $300 million.

Carbon costs

The carbon intensity of generators varies throughout the NEM. Allowing increased power flows between Queensland and New South Wales can allow the market to provide the overall least cost generation option – considering both fuel and carbon cost components.

Figure 3. Emissions Intensity of NEM Generators



Generation in Queensland has a lower average emissions intensity (tonnes of carbon per MWh of energy produced) owing to the higher levels of gas and more efficient coal generation compared to New South Wales and Victoria. By way of comparison, South Australia has the lowest emissions intensity level of these four NEM states, due to a high proportion of wind and gas generation.

The cost of supply summary in Table 1 below outlines the relationship between carbon and fuel costs and the likely benefits accruing from an interconnector upgrade. We find an upgrade assists in lowering the net cost of supply across a range of scenarios carbon and fuel scenarios.

Table 1. Cost of Supply Summary with QNI upgrade

Carbon Price Scenario	Queensland	New South Wales	QNI upgrade impact
Low	Less supply from Gas Generation	More supply from coal generation	Net cost of supply lower Carbon cost slightly higher Fuel costs much lower
High	More supply from gas generation	Less supply from coal generation	Net cost of supply lower Carbon costs much lower Fuel costs slightly higher

In a scenario where the carbon price is low, with the prevailing fuel costs, coal generation is likely to be comparatively lower cost to gas generation. As such, a QNI upgrade would allow for increased dispatch of coal generation from NSW, resulting in a lower net cost of supply. In a world where the carbon price is high, gas generation is likely to be comparatively cheaper than coal. In that situation, a QNI upgrade would dispatch more gas fired generation, which would lower overall costs.

This suggests that regardless of the carbon or fuel prices prevailing at any point in time, increasing the QNI capacity enables the NEM to source the overall least cost available supply resulting in a lower net cost compared to outcomes with a more transmission-constrained environment.

Renewable energy costs

Wind and solar energy are the dominant renewable energy sources entering the NEM. However, the availability of these resources is uneven across the network.

Figures 4 and 5 below show the relative abundance of wind resources in southern states versus the relative abundance of solar resources in northern states. Given these resources are not transportable and differ in cost, an interconnected system is required to ensure the least cost outcome in the development of renewable resources.

Figure 4. Australian Wind Resources

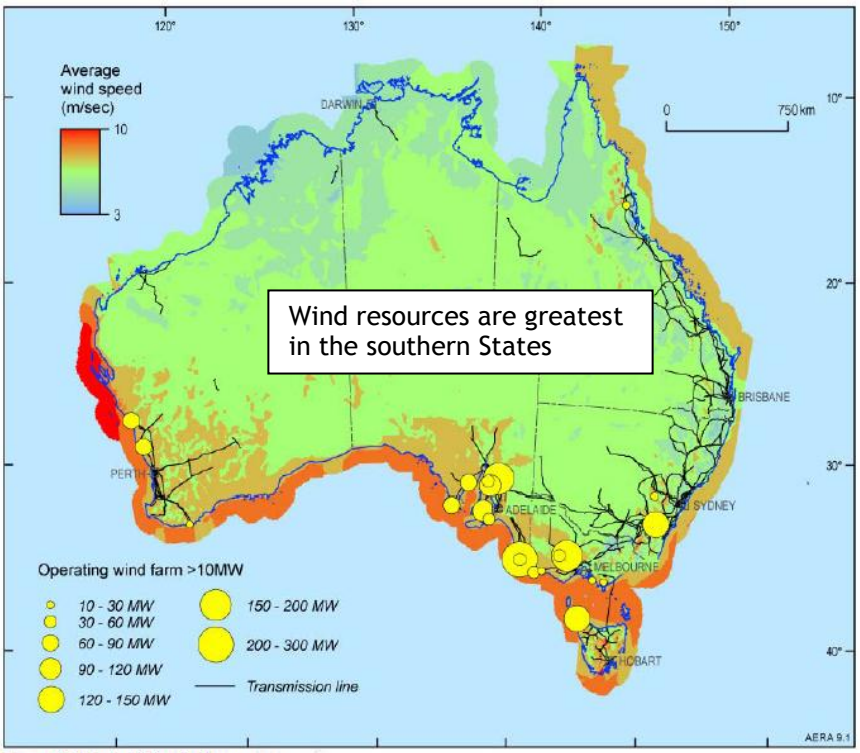


Figure 9.1 Australia's wind resources

Source: Windlab Systems Pty Ltd, DEWHA Renewable Energy Atlas (wind map data); Geoscience Australia

Figure 5. Australian Solar Resources

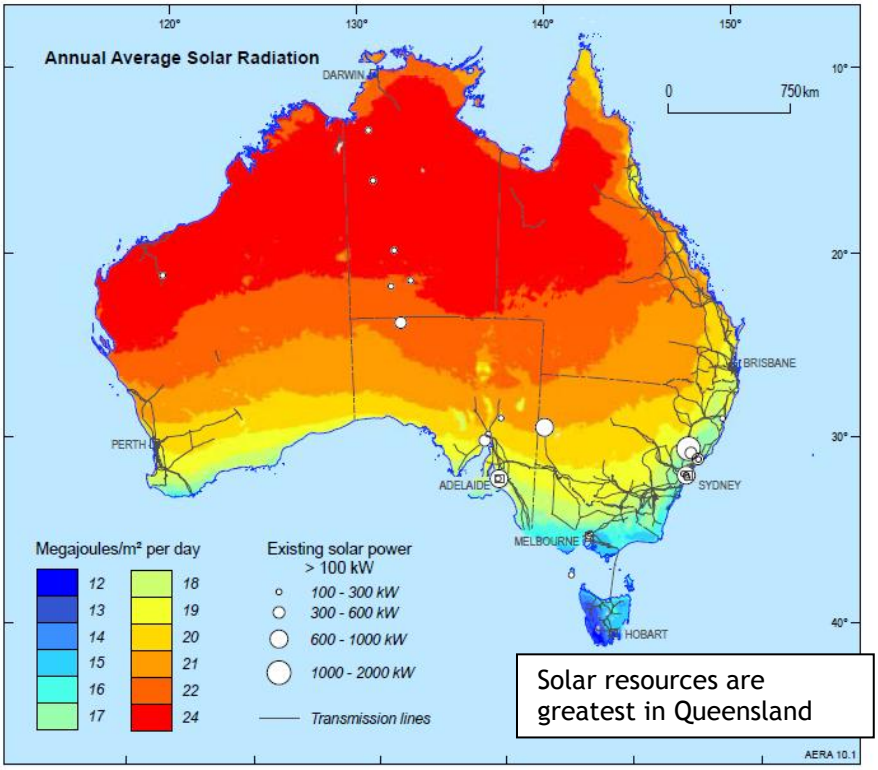


Figure 10.1 Annual average solar radiation (in MJ/m²) and currently installed solar power stations with a capacity of more than 10 kW

Source: Bureau of Meteorology 2009; Geoscience Australia

Without sufficient transfer capacity, growth in renewable generation will have distortionary price impacts. This will be the case whenever minimum generation plus renewable capacity is greater than demand, leading to low and at times negative pricing. These distortionary price outcomes impact longer term generation investment decisions.

The current market outcomes in South Australia provide a good example of a state market in which occasional negative market prices can be explained by the high proportion of 'must run' wind supply, a limited local off-peak market and insufficient interconnector capacity.

2. Improve Economic Investment

Interconnector upgrades can offer a more economically efficient solution for delivering additional generation capacity to the NEM regions relative to building new generation capacity.

Figure 6 below summarises the QNI credible options identified in the TransGrid and Powerlink Project Specification Consultation Report.

Figure 6. Summary of Credible Options

Option	Qld to NSW Increase (MW)	NSW to Qld Increase (MW)	Preliminary Cost Estimate ($ M)	Time years
1a Series compensation	470 to 640	210 to 250	150	4
1b Series compensation with SVC	590 to 800	230 to 380	200	4
2 SVC	70 to 80	100 to 130	70	4
3 System protection scheme, FFCT	-	40 to 90	5	2
4a Second 330kV HVAC	1,300	1,070	1,300	7
4b New Armidale – Bulli Creek 330kV HVAC	1,040	400	500	7
4c 500kV HVAC	2,200	1,600	2,300	7
5 HVDC	1,400	1,400	500	5
6 Braking resistor	0	100	10	3

Source: Powerlink & TansGrid 2012, *Project Specification Consultation Report - Development of the Queensland - NSW Interconnector*, October 2012, p.45.

Consider Option 5 (in Figure 6), which is a QNI upgrade of 1400 MW costing only $500 million or the equivalent of $0.36 million per MW. This compares favourably with a cost for a new power station of $1.062 million per MW (ACIL AETA technology costs for a CCGT power station). Assuming an 85% capacity factor, to obtain the same 1400 MW capacity shown above with a new CCGT, would cost $1.75 billion. This would be more than three times the cost of Option 5. Also, operating costs for an interconnector are much lower than for a new CCGT power station.

3. Additional wholesale competition benefits

Upgrading QNI capacity will increase both spot & contract market competition, which could place downward pressure on prices.

The ability to source lowest cost generation as well as an increased reliability/capacity reducing system volatility gives rise to more competitive spot prices. This can also influence contract prices, with an increased level of inter-regional flow supporting additional inter-regional contract supply (and thereby increasing market liquidity). Overall, these benefits can lead to more efficient wholesale market outcomes, which support a more competitive retail market.

4. System Reliability

Depending on what option is implemented, Origin also considers that there are potential system reliability benefits arising from a QNI augmentation. These reliability benefits are potentially twofold:

- Additional new transmission elements, particularly new additional lines, could enable continuity of supply in the event of an outage on other QNI transmission elements; and
- Increased QNI capacity could allow increased sharing of generation reserve capacity between regions. Should plant outages prevent dispatch of certain generation within a region - resulting in a generation shortfall in that region - available generation capacity in the neighbouring region could be used to supply any shortfall and reduce the need for load shedding.

5. Further information

Origin appreciates the opportunity to contribute to TransGrid's and Powerlink's consultation process. Overall, Origin supports an economic upgrade to the QNI and looks forward to engaging throughout the RIT-T process on this important initiative.

If you have any queries in relation to the above please do not hesitate to contact me on (07) 3037 7001.

Yours sincerely

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Development